International Journal of Trend in Scientific Research and Development (IJTSRD)
International Open Access Journal
ISSN No: 2456 - 6470 | www.ijtsrd.com | Volume - 2 | Issue – 5

A Critical Analysis of Banana Cultivation in Thoothukudi District of Tamil Nadu

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ABSTRACT
Banana is a very popular fruit due to its low price and high nutritive value. The study was conducted at Thoothukudi district of Tamil Nadu. Two blocks in Thoothukudi were selected for this study and 120 respondents were selected from two villages in each block by proportionate random sampling method to assess the extent of knowledge and adoption of banana cultivation technologies by banana growers and also 40 banana growing farmers who adopted drip-irrigation system were selected as purposively for assessing the performance of drip-irrigation in banana cultivation. The study here explored the extent of knowledge and adoption level of banana growers and performance of drip-irrigation in banana cultivation. With respect to knowledge and adoption level of banana growers, majority of the respondents 54.17 per cent had high level of knowledge on banana cultivation technologies and 87.50 per cent had medium to high level of adoption of banana cultivation technologies. With regard to the performance of drip-irrigation in banana cultivation, the benefits as perceived by the drip adopted banana growers were reduced weed growth, less labour requirement for irrigation, weed management, fertilizer application and also increases the water use efficiency. These studies also suggested that necessary follow up help should be given to the drip adopted banana growers after installation by the company and impart trainings to banana growers on maintenance of drip-irrigation equipment.

Keywords: *Banana cultivation, Knowledge, Adoption and Drip-irrigation*

INTRODUCTION
Banana is a very popular fruit due to its low price and high nutritive value. Bananas are predominantly produced in Asia, Latin America and Africa. India is the biggest producers of banana. Globally, banana production had reached a record of 117.9 million tonnes in 2015 as compared to 2000. In India, banana is an important fruit crop grown next to mango. The area under banana was 8.03 lakh hectares in 2013-14 and the production was 29.7 Metric tonnes with the productivity of about 7.00 Metric per Hectare in 2013-14. In India, the major banana growing states are Tamil Nadu as followed by Karnataka and Andhra Pradesh (Indian Horticulture Database, 2015). Banana being a succulent, evergreen and shallow rooted crop requires large quantity of water of increasing productivity. Water requirement of banana has been worked out to be 1800-2000 mm per annum. In spite of having the largest Irrigated area in the world, India also started facing severe water scarcity in different region (Saleth, 1996). Micro Irrigation is introduced primarily to save water and increase the water use efficiency in agriculture. It was concluded that drip irrigation is viable and more beneficial in region where there is more water scarcity. By using the drip the water use efficiency was higher and the system saved 50.00 per cent of irrigation water (B. Cevik, 1988).

Objectives
1. To assess the extent of knowledge and adoption of banana cultivation technologies by banana growers.
2. To study the performance of drip irrigation in banana cultivation and constraints faced by them.

Methodology

This study was conducted in Thoothukudi district of Tamil Nadu. In Thoothukudi district, two blocks viz., Srivaikundam and Alwarthirunagiri were selected where the area under banana cultivation is predominant. Two villages were selected randomly from each block. From these selected four villages, 120 farmers growing banana were selected by applying proportionate random sampling method to assess the extent of knowledge and adoption of banana cultivation technologies by banana growers and also 40 banana growing farmers who adopted drip irrigation were selected as purposively for assessing the performance of drip-irrigation in banana cultivation. A well-structured interview schedule was prepared to conduct survey. The extent of knowledge and adoption of banana cultivation technologies by banana growers were assessed with the help 32 questions related to crop production technologies, crop protection technologies and harvest technology. The performance of drip-irrigation was assessed by five parameters which were selected in consultation with concerned scientist and extension personnel in the field. The respondents were asked to indicate the constraints in the drip irrigation faced by them under banana cultivation.

Findings and Discussion

Knowledge and Adoption of banana cultivation technologies

Table 1.Distribution of respondents according to their overall knowledge and adoption on banana cultivation technologies

(n = 120)

S. No	Category	Knowledge		Adoption	
		Number	Per cent	Number	Per cent
1.	Low	8	6.67	15	12.50
2.	Medium	47	39.17	58	48.33
3.	High	65	54.17	47	39.17
	Total	120	100.00	120	100.00

It is revealed from Table 1. that majority of the respondents (54.17 %) had high level of knowledge followed by 39.17 per cent of the respondents had medium level of knowledge and the remaining 6.67 per cent of the respondents had low level of knowledge on banana cultivation technologies. Majority of the respondents (87.5 %) had medium to high level of adoption and the remaining 12.5 per cent of the respondents adopted banana cultivation technologies in low level.

Table 2.Technolgy– wise knowledge and adoption level of respondents on banana cultivation practices

(n=120)

S. No.	Practices	Knowledge		Adoption	
		Number	Percent	Number	Percent
I.	**Crop production technologies**				
1.	Season for banana cultivation	120	100.00	120	100.00
2.	Varieties suited	120	100.00	120	100.00
3.	Selection of planting Material (sucker)	119	99.17	118	98.33
4.	Preparation of main field for banana cultivation	117	97.50	94	78.33
	Pre-treatment of sucker				
5.	Pre-treatment practices of sucker	111	92.50	26	21.67
6.	Chemical used for pre-treatment of sucker with dosage	41	34.17	24	20.00
	Sucker planting				
7.	Spacing used for banana	119	99.17	119	99.17
8.	Methods of planting the sucker	120	100.00	120	100.00
	Irrigation Management				
9.	Life irrigation practices	108	90.00	72	60.00
10.	Gap between the subsequent irrigation	118	98.33	109	90.83
	Nutrient Management				
11.	Recommended quantity of N:P:K/plant/yr	120	100.00	103	85.83
12.	Recommended Micro-Nutrient	79	65.83	53	44.17
	Intercultural Operations				

S. No.	Practices	Knowledge		Adoption	
		Number	Percent	Number	Percent
13.	Desuckering	120	100.00	120	100.00
14.	Propping	119	99.17	113	94.17
15.	Earthing up	120	100.00	119	99.17
16.	Denavelling	120	100.00	119	99.17
17.	Peduncle Wrapping	105	87.50	78	65.00
18.	Wind Break	58	48.33	48	40.00
19.	Mulching	78	65.00	71	59.17
20.	Pruning of Leaves	105	87.50	84	70.00
	Weed Management				
21.	Recommended Herbicide	115	95.83	39	32.50
22.	Hand weeding	118	98.33	104	86.67
23.	Inter-cropping practices	78	65.00	11	9.17
II.	**Crop protection technologies**				
	Pest management				
24.	Banana aphid	71	59.17	56	46.67
25.	Pseudostem borer	110	91.67	93	77.50
26.	Rhizome weevil	107	89.17	92	76.67
	Disease management				
27.	Panama Disease (Fusarium wilt)	111	92.50	97	80.83
28.	Freckle leaf spot	107	89.17	97	80.83
29.	Bunchy-top	68	56.67	58	48.33
	Nematode management				
30.	Burrowing nematode	106	88.33	51	42.50
III.	**Harvest**				
31.	Harvesting period	120	100.00	119	99.17
32.	Maturity indices of banana	118	98.33	118	98.33

Crop Production:

Season and Variety

There are two season for banana cultivation i.e., Maasipattam (Feb.–April) and Chithiraipattam (April –May) were practised traditionally in Thoothukudi district. In banana the varieties recommended for Maasipattam in Thoothukudi district are Kadhali, Rasthali, Rasa kadhali, Monthan and Karpooravalli. The varieties recommended for Chithiraipattam in Thoothukudi district are Nendran and Robust.

With respect to adoption, it is evident from the Table 2 that the respondents in the study area raised the crop during both Maasipattam (Kadhali) and Chithiraipattam (Nendran). Also it could be observed that some of the respondents were cultivated both the Kadhali and Nendran variety and some of the respondents cultivated any one among the above mentioned varieties only.

Field Preparation and Sucker Selection

Majority of the respondents (97.05 %) had acquired knowledge on preparation of main field for banana cultivation by forming beds and furrows in the field and 99.17 per cent of the respondents had knowledge on selection of quality sucker (sword suckers of 1.5 to 2.0 kg weight).

With respect to extent of adoption of recommended technologies, majority of the respondents (78.33 %) adopted the crop production technologies like field preparation by forming beds and furrows and recommended selection procedure for planting material (98.33 %). The reason might be due to the fact that these technologies were adopted traditionally over a period of time.

Pre-treatment and Planting of Sucker

It could be observed that more than three fourth of the respondents (92.50%) had knowledge on pre-treatment of sucker and only 34.17 per cent of the respondents had knowledge on the chemical used for sucker treatment. Further, it was observed that majority of the respondents (99.17 %) had knowledge on the recommended spacing and mostly all the respondents were had knowledge on method of planting the sucker.

With respect to extent of adoption, only few respondents (21.67 %) and 20.00 per cent had adopted the pre-treatment of sucker and the chemical used for sucker treatment. More than four fifth of the respondents (99.17 %) adopted the recommended spacing and cent per cent of the respondents adopted the pit method of planting.

Irrigation Management

With respect to Irrigation management, it is concluded that more than four fifth of the respondents (90.00 %) and 98.33 per cent had knowledge on life irrigation technologies and gap between the subsequent irrigation for banana cultivation

With respect to extent of adoption in irrigation management, more than half of the respondents (60.00 %) had adopted the recommended life irrigation technologies and 90.83 per cent of the respondents adopted the correct gap between subsequent irrigation since there is water scarcity.

Nutrient Management

In consideration with nutrient management, all respondent had well versed knowledge level in recommended N: P: K fertilizer dosage for banana cultivation and more than half of the respondents (65.83 %) had knowledge on Micro-Nutrient with recommended dosage.

With respect to extent of adoption level for recommended fertilizers application, it is revealed that 85.83 per cent and 44.17 per cent of the respondents had adopted the recommended level of N: P: K fertilizer and Micro-Nutrient application respectively.

Intercultural Operations

With respect to the Intercultural Operation, it could be observed that all the respondents in the study area had knowledge on desuckering, earthingup and denavelling techniques. Most of the respondents (99.17 %) had knowledge on propping techniques then 87.50 per cent of the respondents had knowledge on both peduncles wrapping and pruning of leaves techniques. Only more than half of the respondents (65.00 %) had knowledge on mulching the field and 48.33 per cent of the respondents had knowledge on wind break on their field.

With respect to the extent of adoption of Intercultural Operation, cent per cent of the respondents had adopted desuckering, 99.17 per cent of the respondents adopted earthingup and denavelling technologies, nearly 94.17 per cent of the respondents were adopting propping technologies. Then 70.00 per cent, 65.00 per cent and 59.17 per cent of the respondents were adopting pruning of leaves, peduncle wrapping and mulching as respectively. Only 40.00 per cent of the respondents had grown casuarina tree sp. as wind break in their field.

Weed Management

With respect to weed management most of the respondents (98.33 %) had knowledge on hand weeding and 95.83 per cent of the respondents had knowledge on herbicide to control weed. Only more than half of the respondents (65.00 %) had knowledge inter-cropping to control weeds.

With respect to the extent of adoption of weed management, more than three fourth of the respondents (86.67 %) were adopting hand weeding and more than one fourth of the respondents (32.50 %) adopted recommended herbicide to control weeds in the field. Only 9.17 per cent of the respondents were adopting inter cropping technologies to control weed growth.

Crop Protection Technologies:

Pest Management

In the study area, the pest such as pseudo stem borer, rhizome weevil and banana aphid were the major pest found in banana cultivation. This might be the reason for higher percentage of respondents acquired knowledge as 91.67 per cent, 89.17 per cent and 59.17 per cent on the pest pseudo stem borer, rhizome weevil and banana aphid respectively.

With respect to extent of adoption, more than three fourth of the respondents (77.50 %) and (76.67 %) were adopted the recommended management technologies for pseudo stem borer and rhizome weevil. Only 46.67 per cent of the respondents followed the recommended management technologies to control banana aphid.

Disease Management

In the study area, the disease such as panama disease, freckle leaf spot and bunchy top disease were the major disease found in banana cultivation. This might be the reason for higher percentage of respondents acquired knowledge as 92.50 per cent, 89.17 per cent and 56.67 per cent on the diseases panama disease, freckle leaf spot and bunchy top respectively.

With respect to extent of adoption, more than three fourth of the respondents (80.83 %) were adopting the management technologies for both the freckle leaf spot and panama disease. only 48.33 per cent of the respondents had adopted the recommended management technologies for bunch top diseases.

Nematode Management

With respect to nematode management, more than three fourth of the respondents (88.33 %) had well knowledge on management technologies for burrowing nematodes.

While considering the extent of adoption of nematode management, more than two fifth of the respondents (42.50 %) had adopted the management technologies for controlling the burrowing nematodes.

Harvest

With respect to harvesting, cent per cent of the respondents had knowledge about the harvesting period and 98.33 per cent of the respondents had knowledge on the maturity indices of banana to harvest. This might be due to their experiences in banana cultivation.

While considering the extent of adoption, majority of the respondents 99.17 per cent were harvesting their fruit at the right time (90 to 150 days after shooting) and 98.33 per cent of the respondents harvested the matured fruit at optimum stage when the colour of the bunch changes from deep green to light yellow.

Table 3.Correlation of characteristics of banana growers with their knowledge

(n=120)

S. No	Variables	Correlation value
X1	Age	-0.081^{NS}
X2	Educational status	0.630**
X3	Occupational status	0.050^{NS}
X4	Family type	-0.001^{NS}
X5	Farm size	0.257**
X6	Area under Banana	0.247**
X7	Experience	-0.041^{NS}
X8	Information Seeking Behaviour	0.638**
X9	Social participation	0.055^{NS}
X10	Innovativeness	0.596**
X11	Scientific Orientation	0.646**
X12	Risk Orientation	0.465**
X13	Progressiveness	0.548**
X14	Credit Orientation	0.169^{NS}
X15	Economic Motivation	-0.043^{NS}
X16	Annual income	0.225*

** Significant at 1 per cent level
* Significant at 5 per cent level
NS Non- Significant

Simple correlation analysis

From the above Table 3, it is revealed that eight variables viz., educational status(X_2), farm size(X_5), area under banana(X_6), information seeking behaviour(X_8), innovativeness(X_{10}), scientific orientation(X_{11}), risk orientation(X_{12}) and progressiveness(X_{13}) showed positive and significant relationship with knowledge (Y_1) at one per cent level of significant. Only one variable annual income(X_{16}) showed positive and significant relationship with knowledge (Y_1) at five per cent level of significant. Then the other variables are showed non-significant relation with knowledge.

In general, the more the educational status, farm size, area under banana, information seeking behaviour, innovativeness, scientific orientation, risk orientation, progressiveness and annual income the more will be the chances for knowing and understanding the technologies and hence the variables showed positive and significant relationship.

Table 4.Correlation of characteristics of banana growers with their adoption

(n=120)

S. No	Variables	Correlation value
X1	Age	-0.132 ^{NS}
X2	Educational status	0.662**
X3	Occupational status	-0.011 ^{NS}
X4	Family type	-0.011 ^{NS}
X5	Farm size	0.256**

X6	Area under Banana	0.247**
X7	Experience	-0.194*
X8	Information Seeking Behaviour	0.612**

S. No	Variables	Correlation value
X9	Social participation	0.005 NS
X10	Innovativeness	0.544**
X11	Scientific Orientation	0.598**
X12	Risk Orientation	0.462**
X13	Progressiveness	0.510**
X14	Credit Orientation	0.221*
X15	Economic Motivation	-0.113 NS
X16	Annual income	0.192*

** Significant at 1 per cent level
* Significant at 5 per cent level
NS Non- Significant

Simple correlation analysis

From the above Table 4, It could be observed that the eight variables educational status (X_2), farm size (X_5), area under banana (X_6), information seeking behaviour (X_8), innovativeness (X_{10}), scientific orientation (X_{11}), risk orientation (X_{12}) and progressiveness (X_{13}) had shown positive and significant association with adoption (Y_2) at one per cent level of significance. Then two variables credit orientation (X_{14}) and annual income (X_{16}) had shown positive and significant association with adoption (Y_2) at five per cent level of significance. Only one variable experience (X_7) had show negative and significant association with adoption (Y_2) at five per cent level of significance. Then the other variables are showed non-significant relation with adoption.

In general, more the educational status, farm size, area under banana, information seeking behaviour, innovativeness, scientific orientation, risk orientation, progressiveness, credit orientation and annual income the more would be the chances for accepting, understanding and adopting the technologies and that might be the reason for positive and significant association with adoption. If more the experiences of banana growers the less would be the chances for accepting the banana cultivation technologies and this might be due to the rigidness of not to change of traditional way of cultivation because of their age old experiences in banana cultivation

Performance of Drip-irrigation in Banana Cultivation

The performance of drip-irrigation in banana cultivation was accessed by five parameters which were selected in consultation with concerned scientist and extension personnels in the field. The performance of banana cultivation in drip irrigation is presented below in Table 5.

Table 5.Performance of drip-irrigation in Banana Cultivation (n=40)

S. No	Particulars		Number	Per cent
I.	**Irrigation:**			
	1.	Increasing the water use efficiency	37	92.50
	2.	Reducing the water losses	35	87.50
	3.	Less labour requirement for irrigation	38	95.00
II.	**Fertilizer application:**			
	1.	Fertigation (Fertilizer + Irrigation)	30	75.00
	2.	Increased fertilizer efficiency	29	72.50
	3.	Less labour requirement for fertilizer application	37	92.50
III.	**Weed management**			
	1.	Reduced weed growth	39	97.50
	2.	Less labour requirement for weed management	38	95.00
IV.	**Pest & Disease Incidences:**			
	1.	Low insect incidence	33	82.50
	2.	Low Disease incidence	33	82.50
V.	**Yield parameters:**			
	1.	Increase in fruit yield	23	57.50
	2.	Increase in bunch weight	26	65.00

From the Table 5 the performances of drip-irrigation in banana cultivation were assessed in various aspects such as irrigation, fertilizer application, weed management, insect and disease incidences and yield parameters. It could be inferred that 92.50 per cent of the respondents reported that drip irrigation increased the water use efficiency followed by 87.50 per cent of the banana growers perceived that water losses reduced in banana cultivation. This might be due to the conventional bed based irrigation resulted in water losses and weed growth in the field.

Due to drip irrigation in banana cultivation, 72.50 per cent of the respondents perceived increased fertilizer efficiency followed by 92.00 and 95.00 per cent of them reported that less labour requirement for fertilizer application and to control of weed respectively. With respect to insect and disease incidence 82.50 per cent felt that reduction in insect and disease incidences due to maintenance of optimum irrigation management and control of plant growth due to drip irrigation.

With regard to yield parameter, majority of the respondents reported that there is increase in bunch weight and increase in fruit yield as compared to conventional method of irrigation in banana cultivation.

Constraints as perceived by the Drip-irrigated banana growers

The respondents were asked to indicate the constraints faced by them under drip irrigated banana cultivation. The constraints as perceived by the drip irrigated banana growers were presented below in the Table 6.

Table 6.Constraints as perceived by the drip-irrigated banana growers

(n=40)

S.No	Particulars	Number	Per cent
1.	Clogging problem in emitter	33	82.50
2.	Difficulty in inter-cultural operations	22	55.00
3.	High initial cost	21	52.50
4.	Restricted root growth	11	27.50

It could be observed from Table 6 that the various constraints perceived by the drip-irrigated banana growers were clogging in the emitter by 82.50 per cent as followed by difficulty in inter-cultural operations by 55.0 per cent and high initial cost for setting up the drip irrigation system (52.50 %), root growth restriction also found to be one of the least constraints as perceived by 27.50 per cent of the farmers who adopted drip irrigation system.

Conclusion

It could be inferred from the study that majority of the respondents (54.17 %) had high level of knowledge on banana cultivation technologies and majority of the respondents (87.5 %) had medium to high level of adoption of banana cultivation technologies.

With respect to the performance of drip-irrigation in banana cultivation, major benefits as perceived by the respondents were reduced weed growth, less labour requirement for irrigation, weed management and fertilizer application. Further, it also increases the water use efficiency. Then the constraints in drip-irrigation as perceived by the respondents were clogging in the emitter, difficult in inter-cultural operations and high initial cost while setting up the drip irrigation system in the field. Hence it is suggested that necessary follow up help should be given by the company after installation of drip-irrigation system and also need to impart training to the farmers on maintenance of drip-irrigation equipment.

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